ASR in Texas:

What Is It &
Where Do We Stand?

Capital Area Chapter
Texas American Water Works Association

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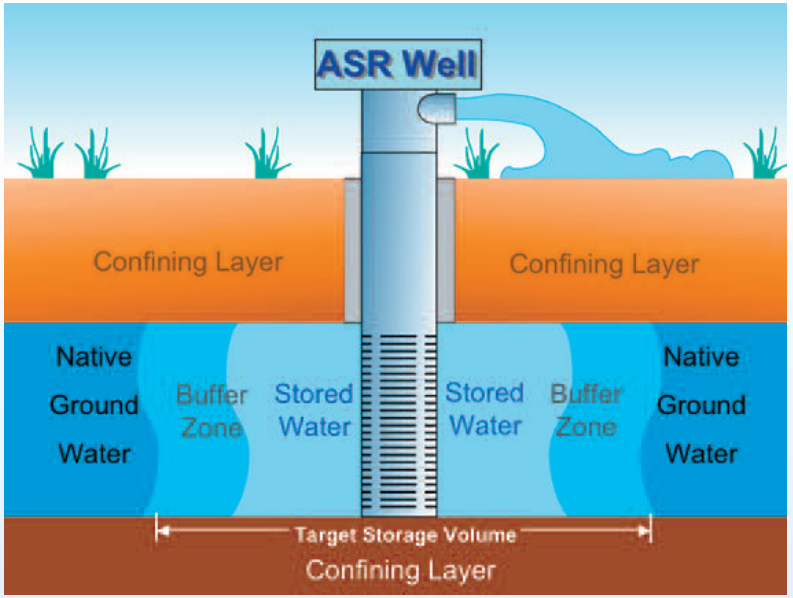
The following presentation is based upon professional research and analysis within the scope of the Texas Water Development Board's statutory responsibilities and priorities but, unless specifically noted, does not necessarily reflect official Board positions or decisions.

What is ASR?

- Aquifer Storage and Recovery
  - Storage of water in a suitable aquifer and recovery of that water during times of need for beneficial use
  - Source water can be reclaimed, groundwater, or surface water; surface is most prevalent
  - Must conform to EPA primary drinking water standards if native water is below 10,000 mg/L of total dissolved solids
  - Buffer zone, hydrologic modeling and purpose of use critical to sizing



Source: NGWA

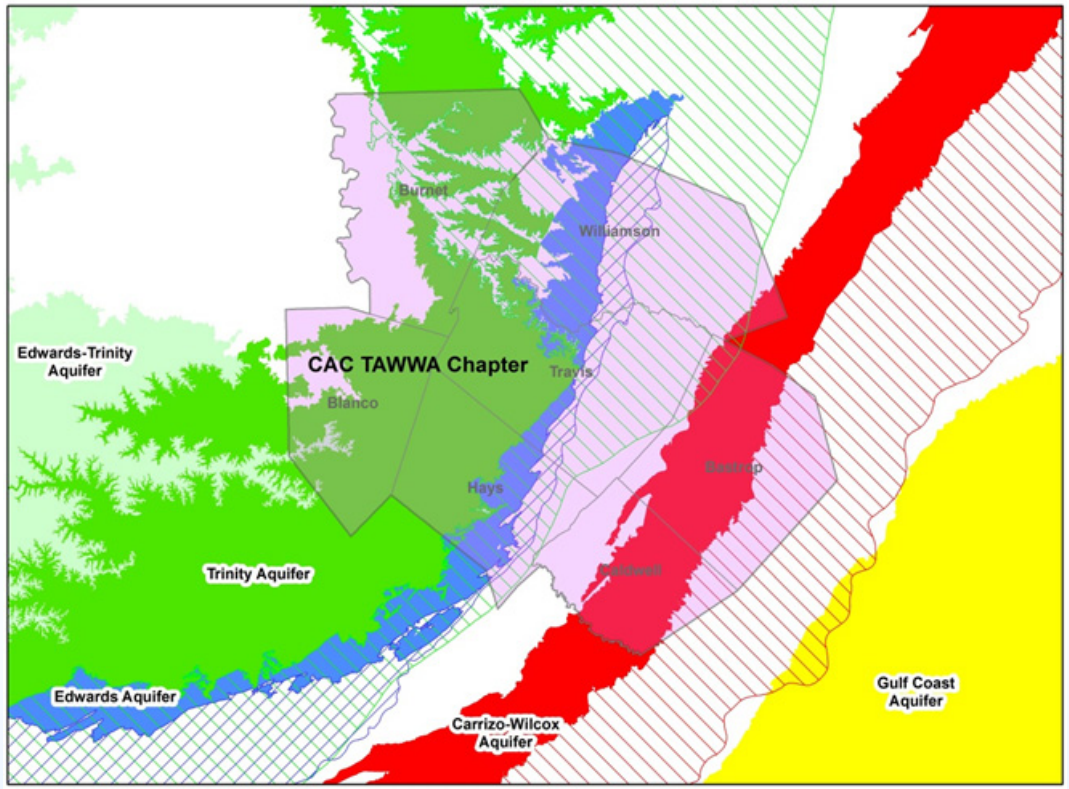
Benefits (partial)

- Eliminates evaporative losses
  - Compare to 33.8M acre-feet of surface storage
  - Compare to 18.0M ac-feet total state demand in 2012
  - 7.2M acre-feet lost in average year (20% of storage, 40% of demand)
  - 8.3M acre-feet lost in very dry 2011 (24% of storage, 46% of demand)
- Mitigates surface inundation effects
  - Mid-size ASR of 37k ac-feet would require 2,500 acre surface reservoir
  - About twice the area of Walter E. Long or Lake Georgetown
- Maximize existing resources
  - Junior surface rights or aquifer curtailment
  - Transmission pipelines
  - Water treatment plants
  - Desalination plants

Limits/Challenges (partial)

- Does not provide flood control
- Offers no recreational benefits
- Requires appropriate geology
- Hydraulic migration
  - Movement of stored water away from recovery well
  - Function of gradient, conductivity, and storage duration
  - Easier to manage with higher well counts
- Stored water protection
  - Surface pumping right ownership – El Paso and San Antonio
  - Municipal ordinance – Kerrville
  - GCD authority nullified (mostly) with HB 655
- Geochemical interaction
  - Well plugging
  - Chemical mobilization

Aquifers in the CAC Area

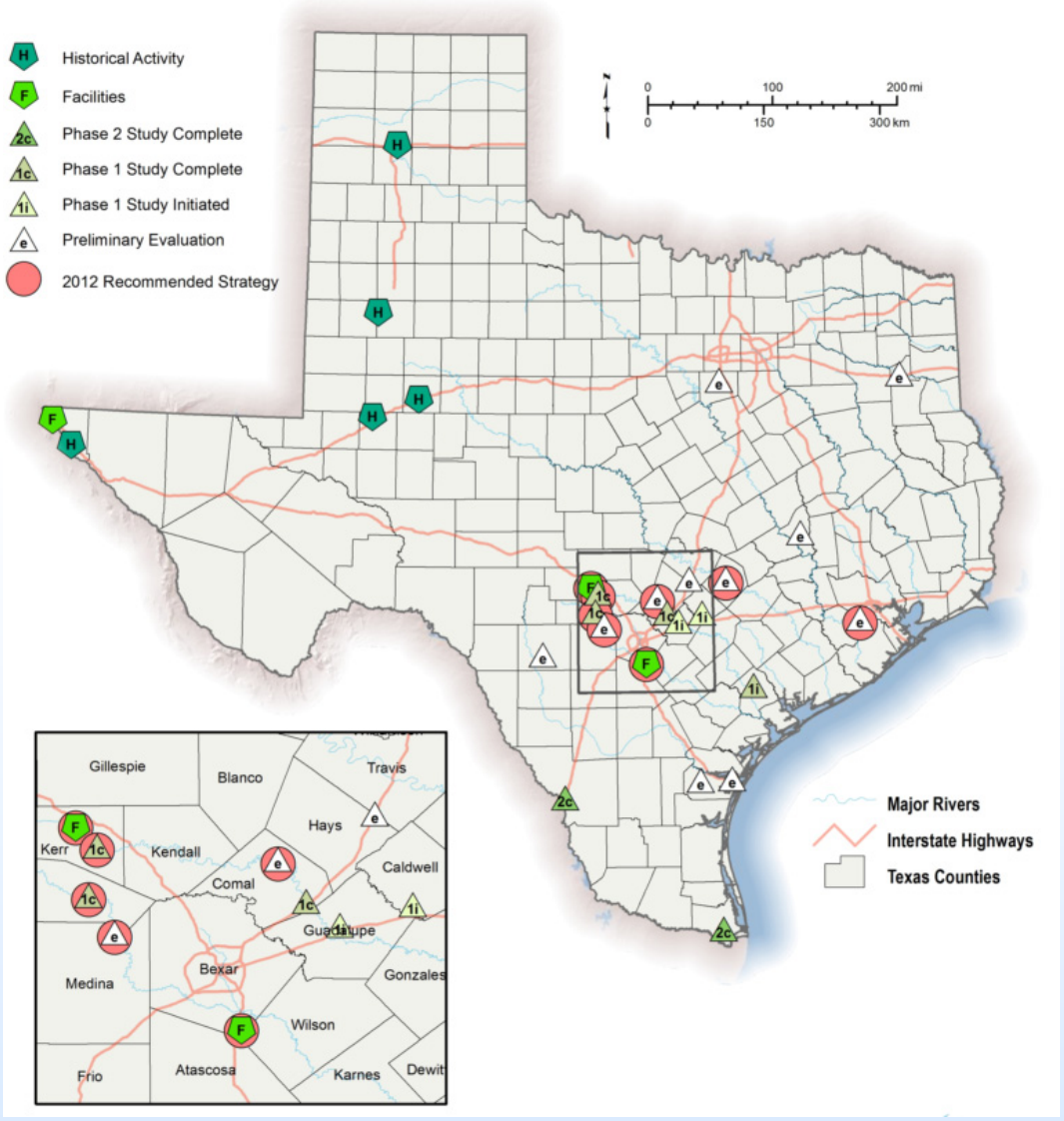


- Several good storage target aquifers
  - Kerrville uses Trinity
  - San Antonio uses Carrizo-Wilcox
  - Barton Springs/Edwards Conservation District investigating saline Edwards

Regulatory

- House Bill 655
  - Signed into law on June 16, 2015
  - Streamlined ASR regulation
    - No pilot program permitting required by law
    - No modification of existing surface water permit
      - If diversion point, diversion terms, and use is unchanged
    - TCEQ has sole authority via Class V UIC permit
      - Rules required by May 31, 2016
    - Greatly limits GCD authority
      - Registration and reporting
      - GCD rules apply if recovery is greater than TCEQ permit

Map of ASR in Texas



Very Early Days

- Early “Artificial Recharge” experiments
  - USGS, Texas Board of Water Engineers, and partner cities
  - City of El Paso; 1947 to 1952
    - Mitigate groundwater declines in the Hueco Bolson Aquifer
    - Source was treated Rio Grande water
    - Four recharge/recovery cycles
    - Good aquifer response and no well clogging
  - City of Amarillo; 1954/1955
    - Mitigate need for pipeline expansion
    - Source was distant Ogallala well field
    - Target was Ogallala field near the city
    - Single season, two-well experiment
    - Good aquifer response and no well clogging
  - No known additional actions taken by the cities

Early Applications

- Colorado River Municipal Water District; 1963 to 1970
  - Goal to utilize excess transmission capacity from J.B Thomas reservoir
  - Storage target was Ogallala; recovered to meet peak demand for Odessa
  - Injected raw water
  - Distribution system redesign in 1969 removed excess capacity
  - Region considering ASR in upcoming RWP
- High Plains; early 1970's to mid 1980's
  - Lamesa, Levelland, and Lubbock
  - Goal to maximize purchase under take-or-pay contract from Lake Meredith
  - Storage was in the Ogallala
  - Demand growth eventually outstripped excess contracted supply
  - Region considering ASR in upcoming RWP

Early Applications (2)

- City of Midland; early 1970's to mid 1990's
  - Goal to increase well yield near Midland
  - Nearby field used was less productive
  - Remote field (Ogallala) was more productive
  - Seasonal injection to closer field was used to meet peak demands
  - Ceased due to demand outstripping excess transmission capacity

Current Facilities

- El Paso Water Utilities - 1985
  - Goal to decrease water level declines in Hueco Boson and minimize discharge piping
  - Source is reclaimed water
  - Storage is via 2 injection wells (once 10) and six infiltration basins
  - Reduced water level decline from 3 to 1 foot annually
- City of Kerrville - 1998
  - Goal to firm up water supplies from Guadalupe River during drought
  - Storage in Lower Trinity
  - Two wells with 2.7MGD of recovery; expanding to 4MGD in future
  - 1.8k ac-ft (600M gallons) in storage
- San Antonio Water System - 2004
  - Goal to firm up supplies during curtailment of Edwards pumping
  - Storage in Carrizo Formation
  - Second largest in the U.S. after Las Vegas
  - 60 MGD capacity and ~70k ac-ft in storage

ASR plans in the CAC Area

- Based on 2016 Initially Prepared Plans
  - Available at http://www.twdb.texas.gov/waterplanning/rwp/plans/2016/IPP.asp
- BSEACD (Recommended Strategy, Region K)
  - Goal to maintain minimum flows at Barton Springs
  - Source is Edwards groundwater
  - Likely target is the saline Edwards
- City of Austin (Recommended Strategy, Region K)
  - Goal to improve drought resiliency
  - Source is treated Colorado River surface water
  - Storage in the Trinity or Northern Edwards
- GBRA – Luling area (Alternative Strategy, Region L)
  - Goal to maximize WTP utilization and firm up supply
  - Source is treated San Marcos River surface water
  - Storage in the Wilcox formation

Monitored Projects

- Many received TWDB funding
- Several "Other" to be included in the 2016 Regional Water Plans

2012 Recommended Water Management Strategies	
Missouri City	Lower Colorado River Authority
City of Kerrville	San Antonio Water System
Kerr County	Medina Lake Firm Up
Bandera County	Storage above Canyon Lake
Other ASR Programs Being Monitored	
Barton Springs/Edwards	GBRA Mid-Basin
City of College Station	GBRA Luling
City of Corpus Christi	New Braunfels
City of Uvalde	Robstown-Driscoll Regional
City of Victoria	Trinity Aquifer in Johnson County

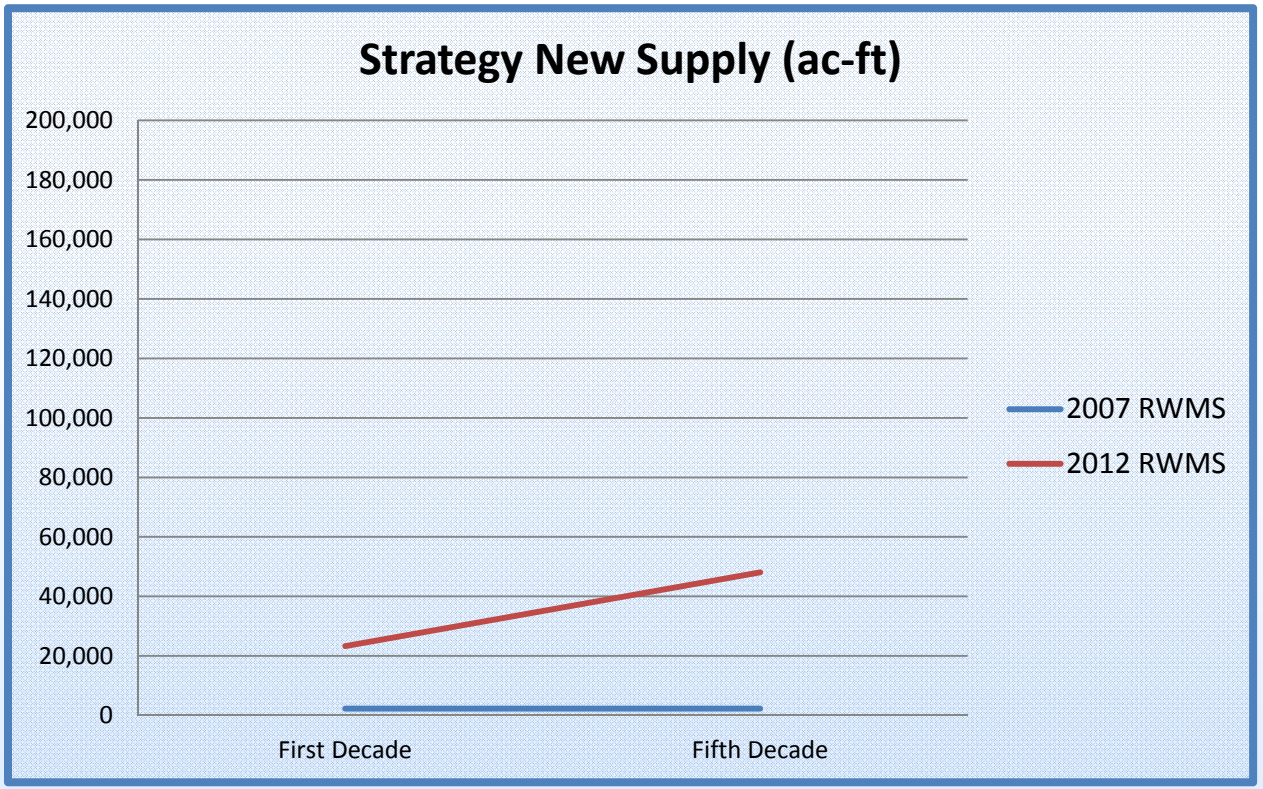
Growth in Interest*

- 2007 State Water Plan - one ASR project as a Recommended Water Management Strategy (RWMS)
  - 2,240 ac-ft first decade of use; 2,240 ac-ft fifth decade

* Excludes infiltration basin projects

Growth in Interest*

- 2012 State Water Plan – eight ASR RWMS projects
  - 23,260 ac-ft first decade of use; 48,084 ac-ft fifth decade



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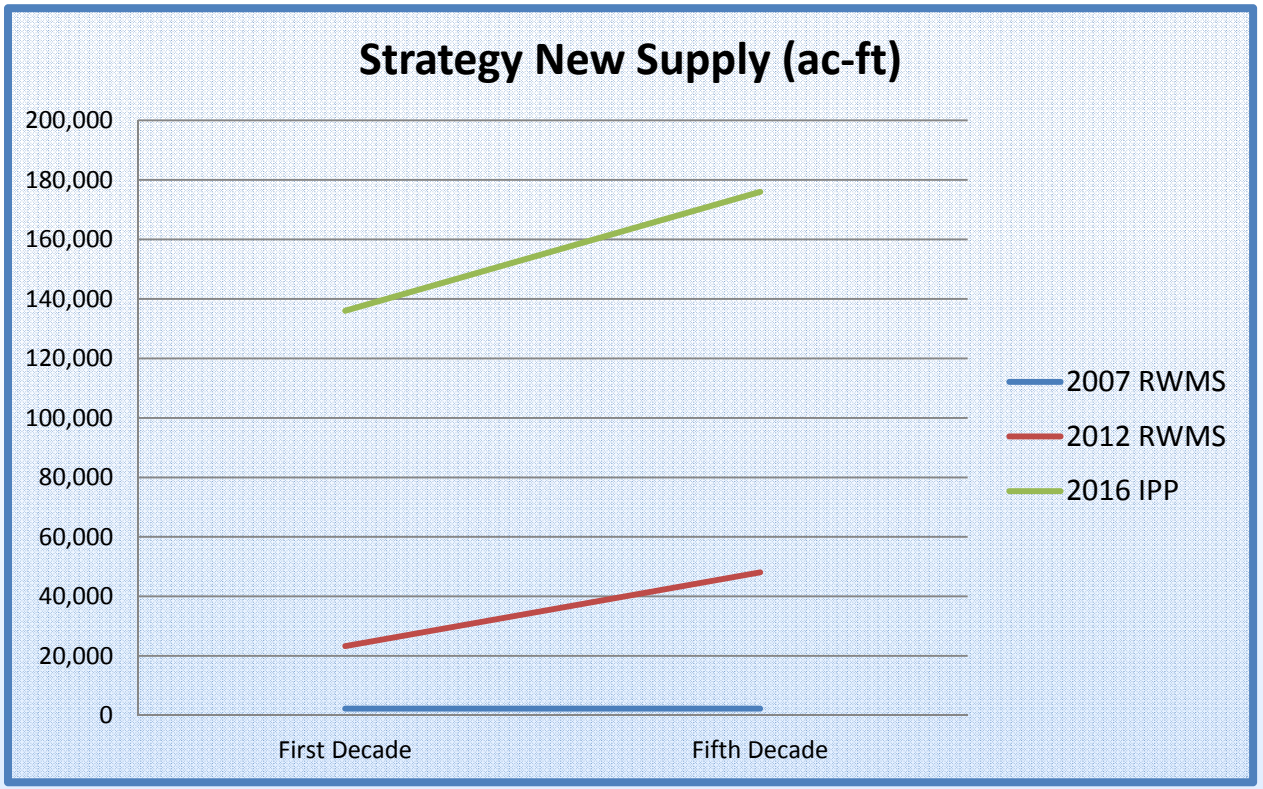
Growth in Interest*

- 2015 Initially Prepared Plans – 15 ASR RWMS projects
  - Preliminary and subject to change
  - 135,992 ac-ft first decade of use; 175,992 ac-ft fifth decade



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  - 135,992 ac-ft first decade; 175,992 fifth decade
  - Fifth decade supply of 80x the 2007 State Water Plan
  - Fifth decade supply of 3.7x the 2012 State Water Plan
- Interest is strong

* Excludes infiltration basin projects

Development Funding

- House Bill 1, Rider 25
  - $1,000,000 grant from General Revenue Fund to TWDB
  - For ASR projects/studies or other innovative storage approaches that improve operational efficiencies
  - Competitive grant application process
    - Mandated to go to groundwater conservation districts
    - GCD and partners must provide matching funds
    - Probable request for applications in October
    - Probable acceptance of application until December
    - Probable grant award early 2016
  - Funding completion deadline Aug 31, 2019

Technical Note 15-04
Aquifer Storage and Recovery in Texas: 2015

- Published in June 2015
- Snapshot as of December 2014
- Descriptions of benefits, challenges and regulatory requirements
- 27 historical, current, and proposed ASR programs
- Program map and associated tables
- Project summaries, evaluation maturity, funding
- Updated periodically to incorporate new information
- Available at www.twdb.texas.gov
  - Innovative Water\ASR TWDB Documents\Technical Reports

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